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ABSTRACT

A study examined the production of lateral consonants in seven male university students bilingual in Spanish and Catalan who had studied French in elementary and secondary school. A questionnaire elicited information about the subjects' use of each language with parents, with friends, at home, and in school. Each subject then read a 775-word text in French. Acoustical analysis of the recorded speech revealed the incidence of velarized (typical of Catalan) and non-velarized (typical of Spanish and French) lateral consonants. Results indicate that the production of lateral consonants in French tended to be the non-velarized variety found in French and Spanish. However, comparison of these results with those of other studies suggests that the context in which Spanish and Catalan are learned may be an important factor in phonetic transfer or interference. (MSE)

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PHONETIC INTERFERENCE IN BILINGUAL SPEAKERS LEARNING A THIRD LANGUAGE: THE PRODUCTION OF LATERAL CONSONANTS [1]

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1. INTRODUCTION

This paper addresses itself to some issues derived from third language learning in a bilingual community and relates them to the findings in the study of second language production in bilinguals. The problem is exemplified with a study of the lateral consonant [l] produced in different speech styles and by different groups of bilingual speakers.

1.1. BILINGUALISM

The study has been carried out in Catalonia, a bilingual community where both Catalan and Spanish are used. Native Catalan speakers are able to use Spanish in any situation and native Spanish speakers living in Catalonia usually understand Catalan, although their production abilities may vary from individual to individual. Specific interference problems arise in that situation and some research has already been carried out at the Phonetics Laboratory of the Universitat Autònoma de Barcelona comparing the performance of bilingual (i.e. Catalan - Spanish) vs. monolingual (i.e. Spanish) subjects when learning French as a third language (Llisterri and Poch, 1987 a, b). Also the characterization of the Spanish variety used by speakers with Catalan as their native language has been studied by a number of researchers.

1.2. LATERALS

In an early work comparing lateral consonants, Navarro (1917) established the velarized character of Catalan [l] in front of the alveolar point of articulation characteristic of this consonant in Castilian Spanish. Further experimental studies have confirmed this remark by showing the existence in Catalan of the lingual retraction common to the so-called "dark" varieties of [l]. Thus, while Spanish - as French and Italian - exhibits a "clear" (i.e.

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alveolar non velarized) lateral, Catalan - as English in certain positions - shows a "dark" (i.e. velarized) allophone of this consonant.

Laterals are produced with resonance in the vocal tract, and therefore they exhibit formants in their acoustic spectrum. Lingual retraction can be indirectly measured looking at the frequency of the second formant (F2), as has been remarked by Delattre : " there is a direct relation between back-and-up and formant two frequency lowering " (Delattre, 1951:232), following Fant's acoustic theory of speech production. A low second formant frequency denotes then a high degree of tongue backing together with an elevation of the posterior part of the tongue towards the velum.

2. SPEAKERS

2.1. SELECTION

We have asked a fairly large group of first year students attending lectures on General Linguistics at the University to answer a questionnaire aimed at determining their use of Catalan and Spanish; information about the time and places where they studied French was also requested.

The questionnaire addressed four skills: listening, speaking, reading and writing both in Spanish and Catalan; the subjects had to answer with a percentage of use of each language in a series of specific environments or situations (i.e. at home, at the university, at work, during their period of leisure ...) This gives an estimate of their activities for each of the four skills. There are also questions about geographical origin - both of the subject and the parents - and about the language spoken with the different members of the family.

2.2. DESCRIPTION

Seven male speakers, university students at the Universitat Autònoma de Barcelona, between 18 and 26 years old were selected. They have studied French at primary and secondary school during 6-7 years, approximately 3 hours a week using similar pedagogical materials.

According to their linguistic background, they may be described as in table 1 . Note that all of them have some knowledge of Catalan - taught at primary and secondary school for those who have Spanish as L1 - Since Spanish is taught as the official language of the whole country, 0% means lack of use, but not lack of knowledge. The speakers appear in the table below ordered from mainly Spanish speakers to mainly Catalan speakers.

SPEAKER	LANGUAGE SPOKEN WITH			LANGUAGE SPOKEN AT	
	FATHER	MOTHER	FRIENDS	HOME	UNIVERS.
FJO	Spanish	Spanish	Spanish	90% Spanish	60% Spanish
				10% Catalan	40% Catalan
FC	Spanish	Spanish	More Spanish than Catalan	100% Spanish	80% Spanish
				0% Catalan	20% Catalan
FH	Spanish	Spanish	Catalan	90% Spanish	30% Spanish
				10% Catalan	70% Catalan
JSA	Spanish	Catalan	Catalan	80% Spanish	80% Spanish
				20% Catalan	20% Catalan
AP	Spanish	Spanish	Catalan	80% Spanish	10% Spanish
				20% Catalan	80% Catalan
JT	Catalan	Catalan	Catalan	0% Spanish	30% Spanish
				100% Catalan	70% Catalan
JS	Catalan	Catalan	Catalan	0% Spanish	0% Spanish
				100% Catalan	100% Catalan

Table I: Linguistic background of the speakers selected for the experiment

3. CORPUS

3.1. TEXT

These seven speakers were asked to read a text in French. It consisted of a two page fragment containing around 775 words; it was randomly selected from a contemporary novel published in 1987. Nevertheless, the number of occurrences of lateral consonants was checked and there was some minor editing to compensate for less represented contexts.

Anyway, for the final analysis only sequences of Vowel- lateral- Vowel /e/ were selected. This gives an average of about 30 cases of lateral consonants

in this particular context for each speaker; then, the total number of consonants analyzed was about 200.

3.2. RECORDINGS

The speakers were recorded in a sound isolated booth at the Phonetics Laboratory at the Universitat Autònoma de Barcelona. They were given some time to read the text beforehand and its general meaning was explained to them; questions about specific points were also answered.

They were asked to read the text at their normal rate and they were allowed to repeat paragraphs when in trouble.

A Sennheiser MD 441N directional cardioid microphone and a Revox A77 high quality tape recorder were used.

4. ACOUSTIC ANALYSIS

The acoustic analysis of the utterances was made with the MacSpeech Lab II™ software package by GW Instruments, Inc., running on an Apple Macintosh SE/30™.

4.1. SEGMENTATION

The audio wave was segmented, locating the boundaries of the lateral consonant. Two criteria have been followed
(a) changes in amplitude in the waveform; this can be observed at different time scales for accuracy when delimiting the boundaries between segments.
(b) perceptual checking by listening to the segmented utterance.
By combining these two criteria, very short utterances of the lateral consonant may also be analyzed without great difficulties.

4.2. FREQUENCY ANALYSIS

In order to locate the frequency of the second formant - taken as the acoustic correlate of velarization -, we have used the LPC algorithm available in the software described. Given a sampling rate of 10Khz a 13 pole model was used in the analysis. A preemphasis of 6dB was also applied. This gives an accurate representation of the response curve of the vocal tract at the selected point; formants are shown as the most prominent peaks in the LPC spectrum.

4.3. RESULTS

4.3.1. MEAN VALUES OF F2 FOR EACH SPEAKER IN FRENCH

The histogram of the mean value of French [l] F2 for each speaker (Figure 1) shows that our subjects behave in a similar manner; the range of variation is between 1500Hz and 1675 Hz. Only JT and JSA present statistically significant differences with the rest of the speakers.

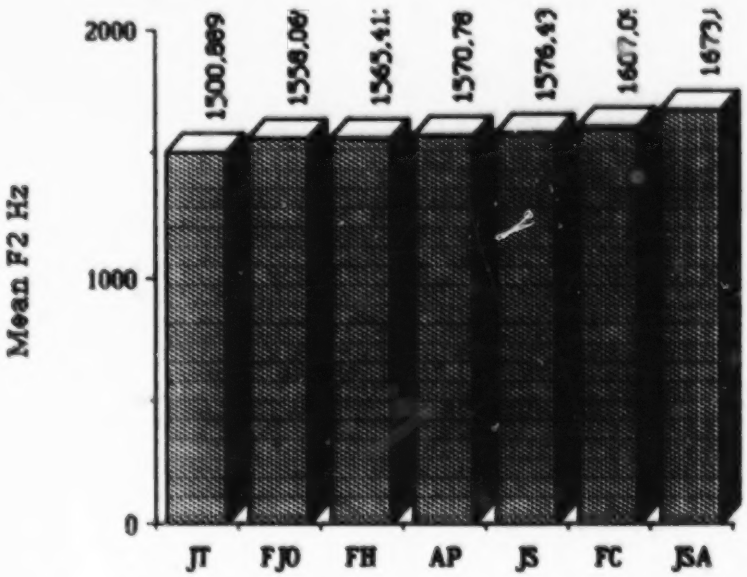

Figure 1: French F2 mean value for each speaker

4.3.2. CONTEXT DEPENDENCY

Bladon and Carbonaro (1978: 52) have stated that " simple alveolar [l] (...) undergoes substantial variation in quality due to the preceding vowel (...) the quality of all cases of Italian alveolar [l] varies considerably in accordance with that of the neighboring vowel, and these effects [are found] with essentially equal strength from both directions i.e. from a following and a preceding vowel " . This dependency from the vowel preceding the lateral is also shown for the French lateral production of each speaker in Figure 2: F2 frequency diminishes from [ile] to [ule], as expected.

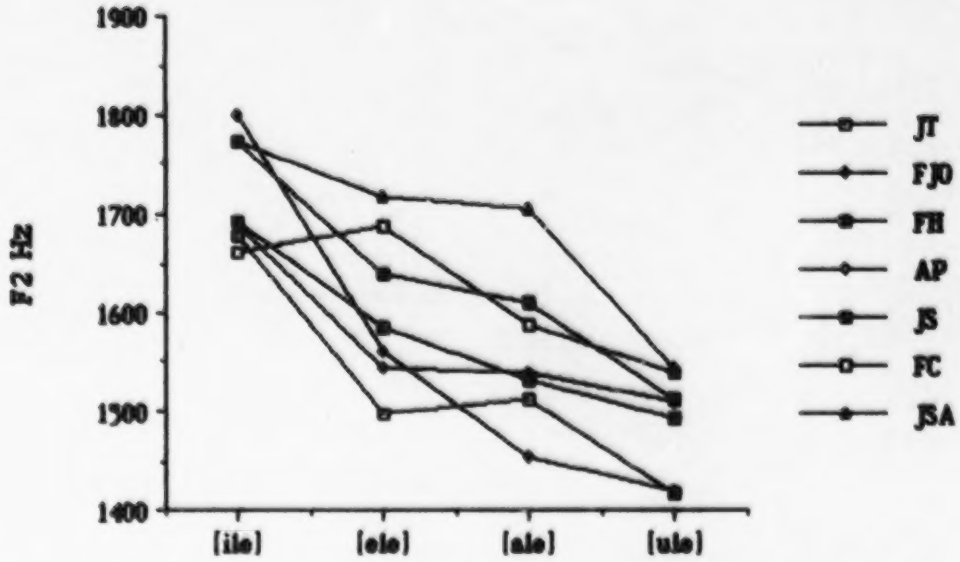

Figure 2: French F2 mean value for each speaker and context

5. DISCUSSION

5.1. COMPARISON WITH SPANISH, CATALAN AND FRENCH LATERALS PRODUCED BY NATIVE SPEAKERS

The comparison of French production in our subjects with F2 measurements of native Spanish (Quilis, Esgueva, Gutiérrez and Cantarero, 1979), native Catalan (Panyella, 1985) and native French (Chafcouloff, 1980) in VlV environments shows that the mean values of our speakers do not lie far away from the native Spanish average, approaching also the native French values, but they differ significantly from the Catalan one (Figure 3). French laterals, according to Chafcouloff (1980) reach a mean F2 value of 1656 Hz; the results in our speakers show a lower F2 compared to the native French ones; the difference, however, is of around 75 Hz. The velar character of catalan [l] is shown in the low F2 frequency as opposed to Spanish and French.

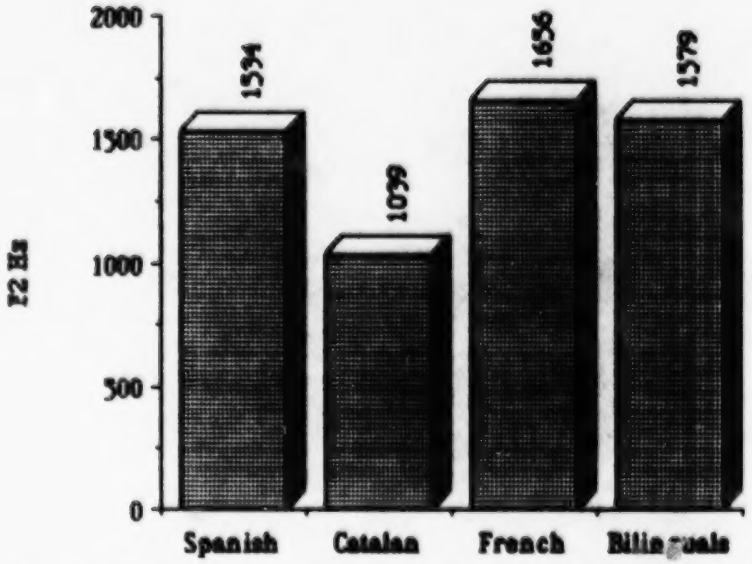

Figure 3: F2 mean values for native Spanish, Catalan and French

This same comparison was applied to each of the individuals, as shown in Figure 4. A Student's t-test performed for each speaker shows significant differences between their French productions and the native Spanish average for laterals in intervocalic position only in two cases - JSA and FH, two subjects that may be considered fairly balanced bilinguals -. In all other cases, the difference between F2 in the French text and the average value for native Spanish is not significantly different. The general results agree with the individual behavior of each subject.

Figure 4: F2 mean values for each speaker compared to native French, Spanish and Catalan

These results may be interpreted as an experimental confirmation of the fact that our group of subjects is transfering the acoustic features of the Spanish lateral consonant - that is, a high F2 indicating a "clear" articulation - to their spoken French. Another possible interpretation might be that they are correctly using the French variety, but this is quite difficult to assume if their "French accent" is considered: the recordings very clearly show the typical features of Spanish and Catalan people speaking French and their overall performance doesn't sound native at all.

If we go back to the table describing the speakers (Table I), this would be a totally predictable result for FJO and FC: both use Spanish almost exclusively at home and predominantly speak this language outside. As for FH and JSA, they do not seem to be so close to the Spanish lateral as the other speakers (it has been noted that differences between their F2 in French and the average F2 in Spanish are statistically significant); looking at their patterns of language use they may be considered quite balanced bilinguals. However, JT and JS - specially this last one - do not show any influence of transfer from Catalan in their French laterals.

An explanation has to be found for this rather unexpected behavior. In our opinion, this could be due to two factors:

(a) the language environment in which learning of French took place. This may explain the case of JT that learned French in a secondary school located in a predominantly Spanish speaking area near Barcelona

characterized by a strong presence of Spanish speaking immigrants - note that he speaks Spanish with friends - ; it has to be remarked that - with few exceptions - Spanish has been the medium of instruction in foreign language teaching in Catalonia; it is still used in areas where Spanish is the most used language. This could also influence the performance of speakers JSA and AP.

(b) fluency in French. Although all the subjects have studied French during the same period and in very similar conditions, listening to the recordings shows that JS is the most fluent of all; he has been taught in French during French lessons and he was able to read the text without noticeable difficulties. This may be a factor that explains the lack of velarization in his lateral productions.

4.2. COMPARISON WITH BILINGUALS' PERFORMANCE IN SPANISH

It may be useful to compare the results of the present study concerning French, with data obtained in a previous research by Martinez (1989), Huerto et al. (1988) and Comas (1986) which are also related to the behavior of bilingual speakers regarding the velarization of the lateral consonant. Data are summarized in Figure 5.

Martinez (1989) - first column labelled Sp L2 c - studied the realization of Spanish laterals by a group of 8 Spanish-Catalan bilingual male subjects reading a newspaper text; they were speakers of the Barcelona variety of Catalan, and for this reason her results are compared to those found for native Catalan by Panyella (1985) - second column labelled Cat L1 - who also studied this variety. The results are quite conclusive and show the transfer of the velar character of Catalan [l] into Spanish when reading a connected text.

Another series of studies was concerned with the variety of Catalan spoken in Girona, which is assumed to be characterized - among other things - by a stronger velar resonance in the lateral consonant. Comas (1986) compared F2 values for the same bilingual subjects, reading words embedded in carrier sentences in Catalan - first column labelled Cat L1 - and in Spanish - Sp L2 w - ; the results show a clear tendency to velarize the Spanish lateral. Huerto et al. (1988) studied a group of speakers of the same geographical origin and language background reading a connected text - second column labelled Sp L2 c - ; higher values are observed, but they also are far below the native Spanish frequency values - Sp L1 - .

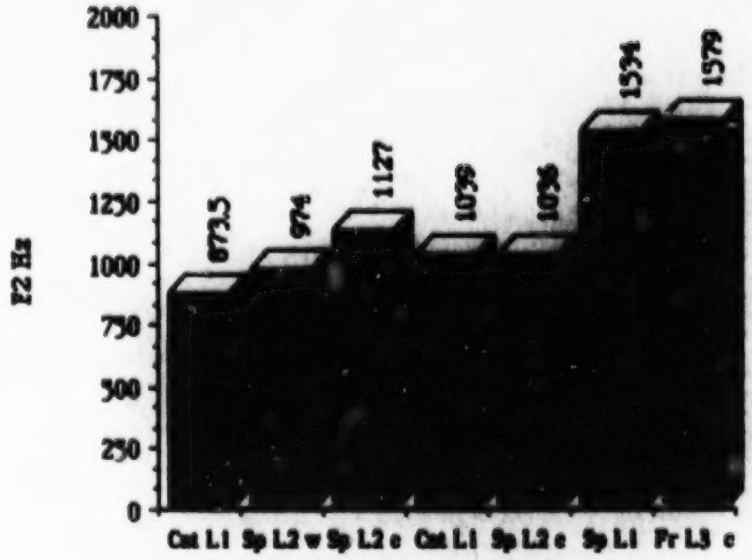

Figure 5: F2 values in bilingual speakers (w-words, c-connected speech)

The study of these results, leads us to conclude that we are dealing with two different groups of subjects. Although they are usually referred to as "bilinguals", it is difficult to assume a good command of the feature "velarization" in the speakers studied by Martinez (1989) , Huerto et al. (1988) and Comas (1986). But the eight speakers chosen for this study seem to have a better command of this feature, al least when speaking a third language.

5. CONCLUSION

The results obtained with our group of speakers reading a French text show that their production the lateral consonant approaches the "clear" variety that is found in French and Spanish. However, one important factor of sociolinguistic nature has to be taken into account when assessing the performance of a bilingual in a third language, i.e. the linguistic environment in which the acquisition of L3 has taken place.

The comparison with the production of the lateral consonant in Spanish by a different group of bilingual speakers leads us to think that this denomination may refer to several linguistic backgrounds, ranging from individuals with a good command of the production of certain phonetic features - such as velarization - to individuals who are just transfering the articulatory gestures of their first language to their second one. " Bilingual ", at least when referring to the phonetic abilities of individuals in a

community were two languages are spoken, may be a designation that embodies different degrees of speech production control.

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